

Chemical Agent Resistant Coating (CARC)

Next Generation Camouflage-More than Meets the Eye

Author: Todd Bullivant

MILSPRAY® 2004

708 Ridge Ave
Asbury Park, NJ 07712
Phone: (732) 776-9988
Fax: (732) 776-8918

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MILSPRAY and “Preserving the Performance Integrity of next generation CARC Camouflage” by Todd Bullivant, President, MILSPRAY Inc.

MILSPRAY®

MILSPRAY has quickly positioned itself as an expert in the field of CARC camouflage maintenance and repair. It currently supplies the U.S. Military with a variety of Chemical Agent Resistant Coating (CARC) touch up products under 40 different National Stock Numbers. The company’s emphasis has been on providing the military with a safe, but effective means of touching up CARC finishes while minimizing environmental impact. MILSPRAY has been used on everything from HMMWVs and reconnaissance vehicles to helicopter rotor blades and fighter jets. This paper, in many respects, is based on the long and extensive experience of MILSPRAY.

Camouflage-More than Meets the Eye

It is a common misconception that today’s camouflage is strictly a visual system intended to conceal vehicles and equipment from enemy detection. While this is partly accurate, true camouflage is a highly sophisticated, multi-functional coating capable of camouflaging and protecting at a much higher level.

True U.S. Military camouflage is achieved using a Chemical Agent Resistant Coating or CARC as it has been known for 20+ years. The military specification for this material is Mil-C-46168D and it has recently been superseded by Mil-DTL-64159, a water-dispersible, improved version of its’ predecessor.

Mil-DTL-64159 water dispersible CARC provides for the following, in addition to its’ visual properties and characteristics:

1. Chemical Agent Resistance

CARC provides protection against chemical and biological agents. When a tactical vehicle is exposed to weapons of mass destruction, such as chemical or biological agents, it must be able to be decontaminated. CARC provides this protection before and after decontamination.

2. Signature Reduction

Key to survivability in combat is avoidance of enemy detection systems. CARC coated vehicles and equipment have signature-reduction properties that diminish the effectiveness of existing and emerging enemy detection systems. While infrared reflectivity is one element of signature-reduction, others and their particulars are considered classified information.

3. Improved Durability

For CARC coating to maintain its chemical agent resistance and signature reduction qualities it must be able to withstand severe wear-intensive environments. The ability of the coating to provide these two critical elements of protection is greatly compromised and diminished if it is damaged in the theater of operation. While much has been done to

address this concern, including many R&D efforts, it is likely to be an ongoing issue. Nano-technology and self-healing coatings offer promise, but these technologies are years away. Furthermore, there are billions of dollars of military assets coated with CARC that will need to be repaired and maintained as new technologies are introduced and phased in.

Water-dispersible CARC provides superior mar resistance, flexibility, and weather durability via the use of nonsiliceous polymeric beads.

Environmental Issues

While few would argue the significance of protecting our equipment and soldiers from weapons of mass destruction, or to hide from enemy forces, there is much debate regarding CARC and health and environmental issues surrounding its use. It has been associated with Gulf War Syndrome, cancer, birth defects, ground contamination, and more.

Two of the most common measurements used in determining impact on the environment, which are also tied to soldier safety during the application process, are Volatile Organic Compounds (VOC) and Volatile Organic Emissions (VOE). The lower the lb/gallon, in both cases, the safer it is for the environment and the soldier. The EPA also regulates Hazardous Air Pollutant (HAP) emissions.

The new water-dispersible CARC (Mil-DTL-64159) has very low levels of volatile organic compounds. VOCs can be found in concentrated amounts in the solvents used to reduce or thin CARC. Since, the newer water-dispersible CARC reduces or thins with de-ionized water, both the VOC and VOE levels are greatly reduced.

	<u>Mil-C-46168D CARC (solvent)</u>	<u>Mil-DTL-64159 (water-dispersible)</u>
Volatile Organic Compounds (VOC):	4.55lb/gal	1.55lb/gal
Volatile Organic Emissions (VOE):	4.55lb/gal	1.07lb/gal

Water-dispersible CARC affords the U.S. military the ability to protect its' soldiers and equipment while adhering to ever stricter environmental regulations.

Safety

The impact on human health and general safety aspects of working with CARC is a topic worthy of its own discussion. It should be noted that Mil-C-46168D CARC and Mil-DTL-64159 water-dispersible CARC are both hazardous materials and need to be treated as such. Both require specific safety gear designed to protect the soldier against the harmful affects, both acute and chronic, of over exposure to CARC. The safety or HAZMAT office on the local base is responsible for ensuring that the appropriate safety equipment is available.

The MSDS for both materials is a good source for information pertaining to the adverse effects of ethyl benzene, crystalline silica, cobalt, methyl ethyl ketone, and other solvents found in Mil-C-46168D CARC.

Special care should be taken when spraying CARC since it is atomized and more easily breathed into the lungs. Crystalline silica is a carcinogen and is present when CARC surfaces are sanded and the dust is airborne.

While the water-dispersible CARC also is a hazardous material it does not have many of the chemicals listed above. In short, it is a “friendlier CARC.”

In both cases, all that is required to eliminate or minimize exposure is the correct equipment, safety gear, and procedures.

Preserving the Performance Integrity of Next Generation CARC Camouflage

Now that the reader has an understanding of the performance characteristics of CARC and the role it plays in protecting soldiers and assets, it should be easier to understand the issues surrounding the field repair and maintenance of these multifunctional protective coatings.

When a vehicle or piece of equipment has a damaged, scraped, or scratched surface the integrity of the CARC is greatly compromised. The continuity of the coat is broken. This means that, depending on the location and size of the surface area damaged, the signature reduction qualities and chemical agent resistance is compromised or greatly diminished. In theory, the vehicle should be returned to the motor pool or maintenance unit for repair. In reality, it is either left as is, or worse yet touched up with camouflage commercial aerosol paint.

By using a \$6 can of commercial touch up paint, a soldier compromises the life of soldiers and jeopardizes the signature-reduction properties of the vehicle. The problem is a common one... “I have a vehicle in need of touch up...what do I use?” the answer has also been a common one, albeit an incorrect one... “I’ll just get some aerosol touch up paint.”

Commercially available aerosol touch up paint is not a military approved means of repairing today’s camouflaged vehicles and equipment. This material is not matched to the Fed-Std-595B color chart, and is instead a commercial camouflage intended for use in hunting and sporting. It will not match true military camouflage.

It is also not UV tested to withstand the rigors of military use. Commercial aerosols are diluted with solvents and will fade and discolor in as little as 200 hours of severe sun exposure. The result is a lime green spot or patch where the vehicle or equipment was touched up. This results in a “bull’s-eye mark” and not camouflage. This is referred to as UV stability and it is severely lacking in commercial coatings.

Finally, these aerosol touch up methods DO NOT provide any chemical or biological agent resistance. Nor do they offer ANY signature reduction capabilities. They are an easy and inexpensive way out- one that puts soldier safety in jeopardy.

An Explanation

CARC, historically, has not been easy to work with. Beyond the safety and environmental issues, there is an application issue. CARC, unlike many commercial paints, is a two-component material requiring exact measuring, mixing, and catalyzation. This is the case with either type of CARC discussed in this paper. When the preferred application method is spraying the Mil-C-

46168D CARC must be thinned with solvents. The waterborne CARC is reduced with de-ionized water.

A soldier needing to touch up a CARC camouflaged vehicle *with* CARC, must open a gallon container of Part A and a container of Part B (catalyst). They must then precisely measure out 4 parts of A to 1 part of B for Mil-C-46168D CARC or 2 parts A to 1 part B for waterborne CARC. Any material mixed and allowed to catalyze expires in 4-8 hours and must be discarded as hazardous waste. This is referred to as the coating “pot life” and it requires that the soldier mix as little as needed to complete the job and to minimize hazardous waste. They must maintain the 4:1 or 2:1 ratio while pouring out of a larger container into smaller jars. Graduated containers or gram scales are needed to ensure that the ratio is maintained on the smaller scale. A soldier then needs to wait 20-30 minutes while the two parts catalyze. Then it can be reduced with solvents or de-ionized water.

Because CARC is a two part coating and must be allowed induction time it is not available in a traditional aerosol can.

ABOUT MILSPRAY

MILSPRAY has a patented aerosol system that allows a soldier to touch up a CARC camouflaged vehicle *with* waterborne CARC. It is comprised of a small capsule/insert that is contained within a bottle. The capsule contains precisely 1 part of B and the bottle it is resting in contains 2 parts of A. The capsule is nitrogen purged and covered top and bottom with a foil seal. A separate aerosol unit containing a sharp siphon tube is used to puncture the top and bottom seal thus allowing the contents of the capsule to drop into the bottle containing part A.

With the aerosol unit in place and the contents catalyzed all a soldier has to do is point and spray. One jar contains 2 ounces and yields 6-8 SF of coverage at 1 mil DFT (Dry Film Thickness).

There is no pouring, measuring, mixing, or clean up. MILSPRAY is South Coast Air Quality District compliant and is exempt from HAZMAT shipping when shipped by ground. The aerosol system has an unusually high transfer rate and a VOC of 1.55lb/gal and a VOE of 1.07 lb/gal. This represents the most environmentally friendly VOC and VOE numbers of any product currently approved for military use. The system is extremely safe for the soldier and the environment. Hazardous waste is kept to minimum or eliminated altogether.

MILSPRAY is currently in use at bases across the U.S. and in Kuwait, Afghanistan, and Iraq.

The company’s complete line of touch up products includes CARC markers, for touching up nicks and scratches, and a NON-HAZMAT “Enviro-Green” military coatings stripper. Other military coatings, packaged for touch up, are also available. They can be reached at (732) 776-9988 or under cage code “3NXK3”

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